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ABSTRACT

One of the newest developments in building is the application of systems analysis to design and construction. The systems approach depends heavily on the use of prefabricated components and modular subsystems, in both design and construction processes. Construction times are shortened and costs often lowered because the flexibility of prefabricated subsystems allows construction on the building shell to proceed while interior design is still in the planning stage. The use of performance specifications provides additional control over construction costs and saves additional time by using products that have already been tested and used successfully. This report focuses on the experience of one architectural engineering firm that uses systems analysis as one approach to the design and construction of school facilities. (Photographs and diagrams may reproduce poorly) (RA)

Building Systems Information Clearinghouse

K/M Associates: A Case Study in Systems Building

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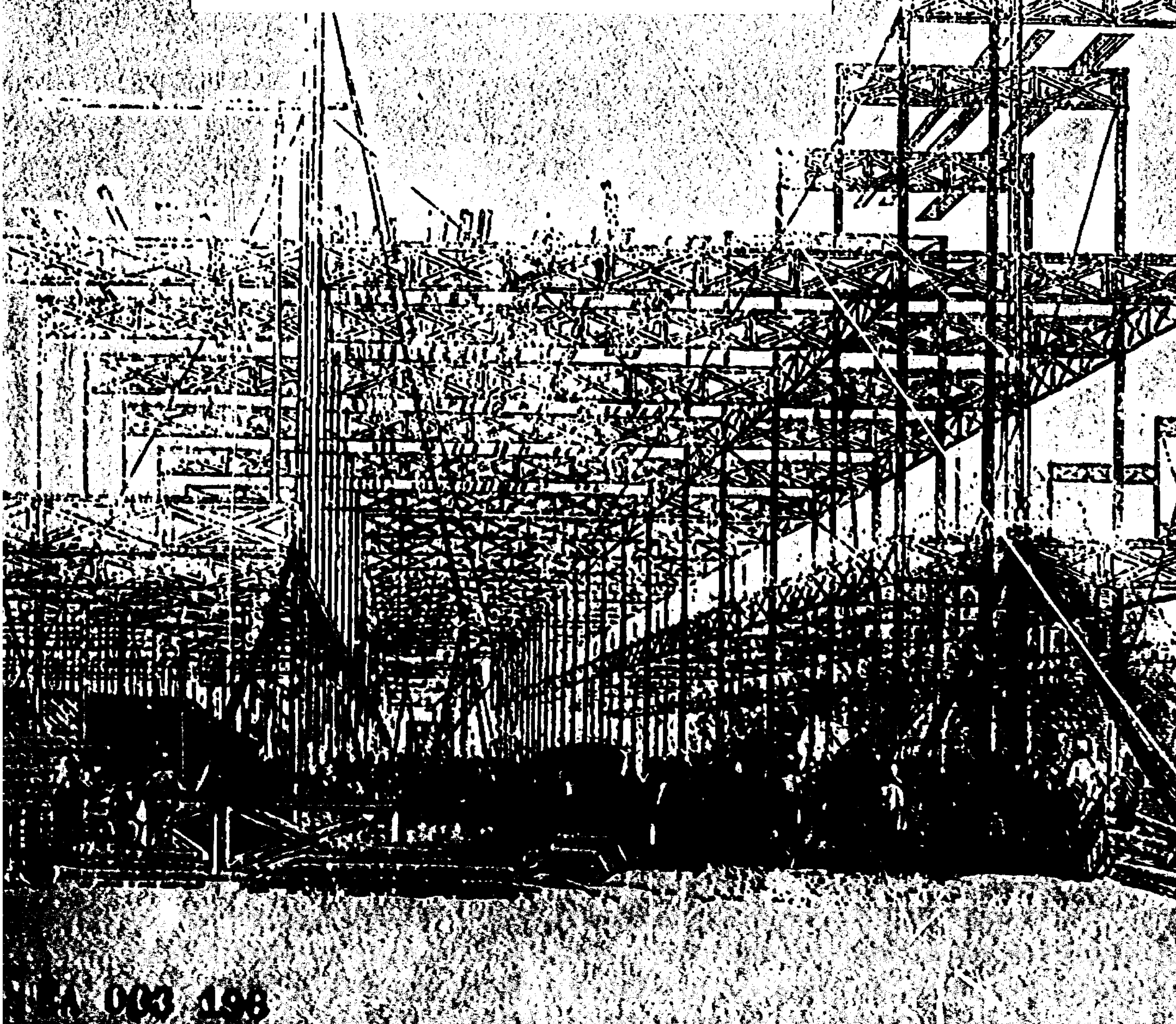

EA 003 198

Building Systems Information Clearinghouse
Research Report Number One
K/M Associates: A Case Study in Systems Building

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Introduction

One of the questions most frequently asked of the Building Systems Information Clearinghouse staff is how an architect can take advantage of the tremendous amount of development that has been done in the large-scale projects such as SCSD, RAS, and SEF. Many architects mistakenly believe that you need a large volume of work before you can make use of the recent developments in systems technology. That this is not the case has been proven by the large number of single projects uncovered by BSIC in developing Special Report No. 2, *A Listing of Schools and Other Buildings Constructed with Building Systems*. In the course of developing this report, we came in contact with many architectural firms, both large and small, who had experienced considerable success in the use of systems.

On the premise that the experience of these firms would be of benefit to other architects who are contemplating the use of systems, BSIC decided to study one firm in depth. The firm selected, K/M Associates Inc. of Elkhart, Indiana, has been developing its systems procedures for more than four years. That this development is a continuous process was evident to BSIC during the six months that this study has been in preparation. The firm is constantly refining its procedures as each new project is evaluated.

It is not our purpose to suggest that the procedures and work of K/M represent the only way to approach the problem of the design and construction of school facilities. Each reader must judge for himself how these procedures may be adapted to his particular situation.

If this report serves to stimulate others to reexamine their present procedures in the light of what has been presented, our objectives will have been realized.

J.R.B.

K/M Associates and Building Systems

K/M Associates Inc. is an Elkhart, Indiana, architectural and engineering firm which has achieved considerable success in the application of systems building[1] to school construction projects. This firm has designed a number of educational facilities projects with building systems,[2] including two academic buildings on the South Bend campus of Indiana University, and schools in Illinois, Indiana, Michigan, and Maryland. Descriptions and photos of K/M systems projects follow this article.

[1] In this article, "systems building" is defined as the application of systems analysis to design and construction.

[2] A "building system" is a set of integrated component subsystems which together, or with the addition of other components, form a building.

The firm. Organization within the firm is by department with each department responsible for a specific aspect of project development. Current departments are Architectural, Mechanical and Electrical Engineering, Specifications Writing, and Structural Engineering. A field office staff, clerical personnel, and an educational expert serve these departments. Current employment is approximately thirty persons.

Part of K/M's success with building systems is due to the excellent rapport between the architectural and engineering departments. This rapport is partially the result of an understanding of the use of building systems by senior personnel, an understanding which has come about as a result of K/M experience with this approach in a number of projects.

Another factor contributing to K/M's successful use of building systems is the feeling by senior personnel that building systems do not represent a radical change within the industry. K/M has not found it necessary to undergo a major reorganization to use the building systems approach, but has veived the problem as one of the rational application of a new building technology within an already effective office structure.

K/M Associates and building systems. K/M involvement with building systems began, as did modern North American systems building, with the EFL-supported School Construction Systems Development Project (SCSD). After a study of this program, including visits to the then newly constructed SCSD Mock-Up Building and several of the SCSD schools, Richard Paul Miller, now K/M's Vice President,[3] began to develop a school project applying the lessons of SCSD.

This project, Norwell High School, Ossian, Indiana, was occupied in September 1968. As in SCSD, a two-stage bidding procedure was used with four component subsystems—structure, lighting-ceiling, HVAC, and partitions—which were bid using performance specifications patterned on those developed for SCSD.

Success on this project led the architects to apply building systems to other educational facilities projects, during which design techniques and systems procedures were developed and refined. The firm's transition from design for conventional construction to design with building systems went a step further in January 1970, with a decision to use a systems building approach on all their educational facilities projects.

In order to stimulate competition among structural bidders on early systems projects, the firm undertook to develop a structural system which could be bid by any small steel fabricator. This "system" was developed from the structural designs and details of K/M's systems schools. The framing plans of the most often used structural bays, known as "standard multi-module groups" or "supermodules," are used by K/M architects in developing preliminary designs.

Although there is now much greater competition among manufacturers of proprietary structural systems, K/M finds that there is considerable political and economic advantage to the bidding of this "in-house" system. Ultimately, the firm plans to put out a completely designed and largely—"80 per cent"—predetailed steel structural system for competitive bidding by local fabricators. Experience shows that, by bidding on these drawings, local fabricators can compete with larger national structural manufacturers.

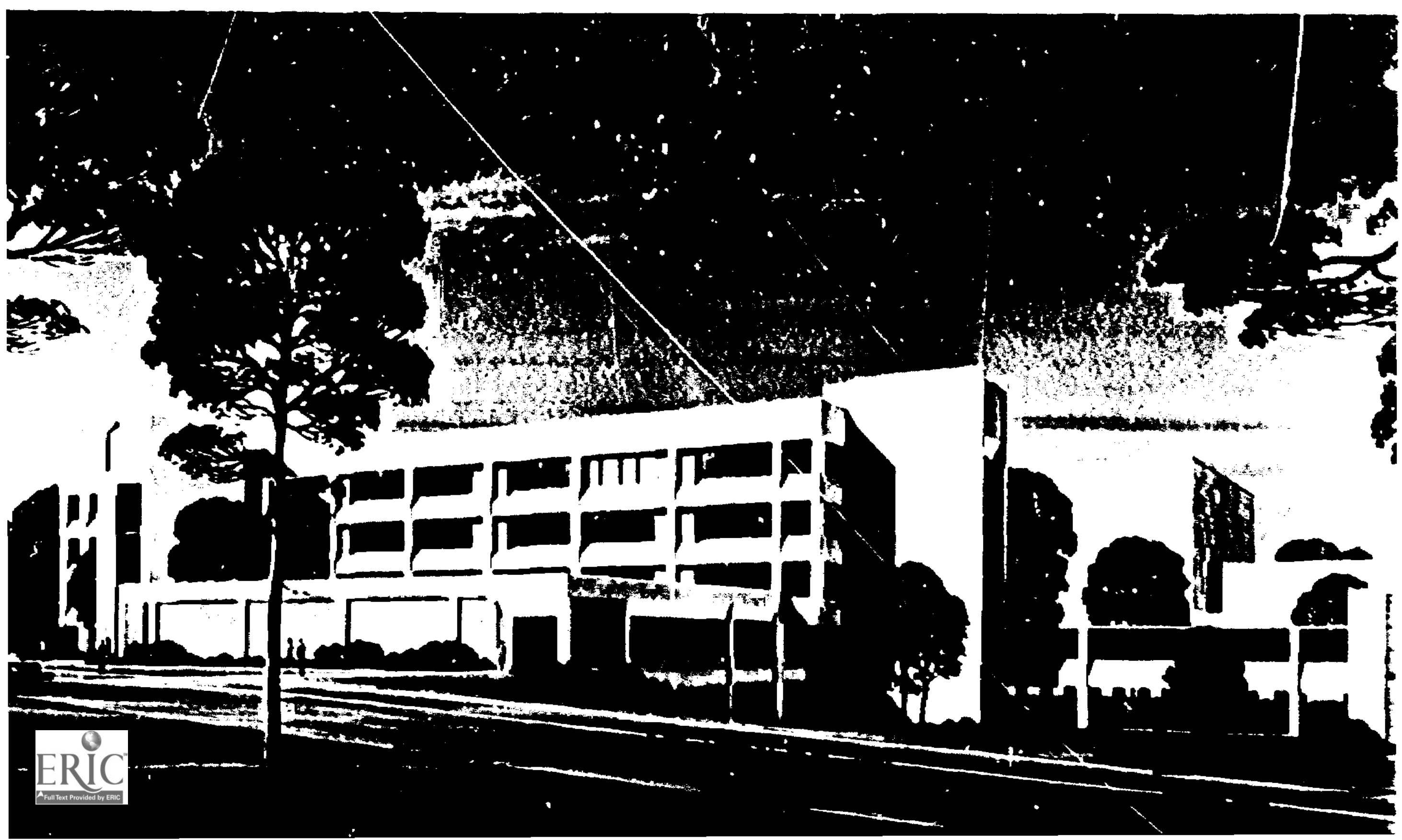
For the Library and Science Building at Indiana University, South Bend, Indiana, K/M has designed a precast concrete structural and exterior wall subsystem. This subsystem is completely compatible with other component subsystems and retains the dimensional characteristics of SCSD-type systems, particularly the 5'-0" by 5'-0" horizontal module. This building is intended to be the first of a new group of buildings on the South Bend campus and, as a result, the designed subsystem is prototypical. The forms, designed by K/M, for the subsystem are property of the University and, if the first stage is a success, will be used for the later buildings.

In another Indiana University building at South Bend, the Dental Hygiene Building, K/M used an exterior wall subsystem in addition to structure, lighting-ceiling, HVAC, and partition subsystems. This subsystem has proven so successful that K/M has recently decided to bid an exterior wall subsystem on other projects.

K/M is studying other subsystem possibilities, including electrical and electronic distribution. The firm is also investigating possible application

[3] Other K/M officers are Thomas R. Keene, President; David Albright, Secretary; Jerry Fair, Director; and William Erickson, Director.

Major advances in K/M's use of building systems came on both of the firm's projects for the South Bend Campus of Indiana University. On Riverside Hall (above), a dental hygiene laboratory with faculty offices, K/M included the exterior wall in the building system. The precast concrete structural/exterior wall subsystem of the Library and Science Building (below) was designed by K/M and prebid. The firm intends to apply both an exterior skin subsystem and a concrete structural subsystem to other projects.



of systems to special areas such as science and home economics. For urban schools, K/M engineers are studying a concrete structural system composed of "off the shelf" precast items which would be bid in much the same way as the current "in-house" steel system.

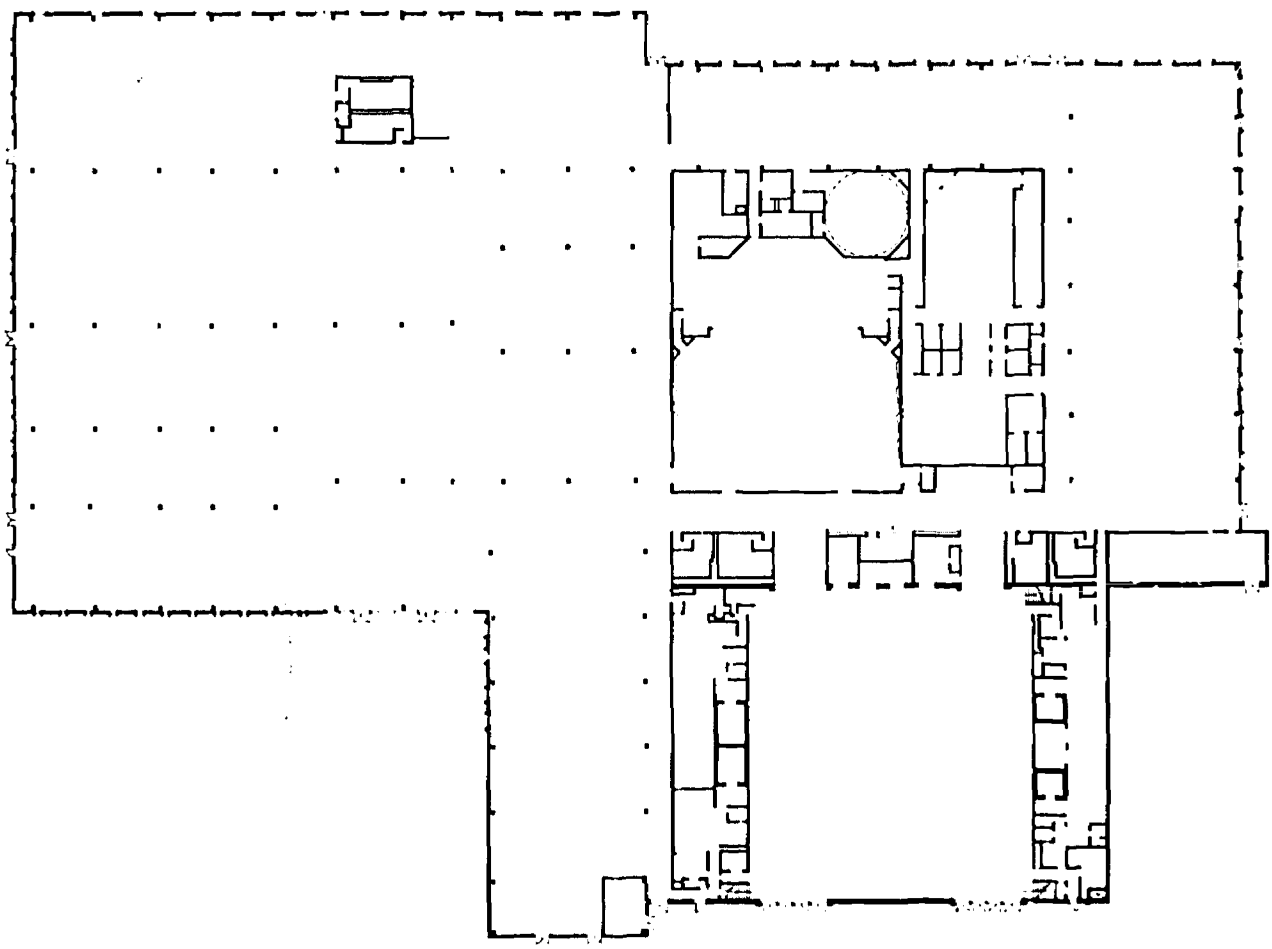
In a recent conversation, Miller told BSIC that K/M attempts to view building systems as part of a total approach to design and not merely as a group of "things." Miller feels that the major advantage to architects of systems building over other techniques lies in the better ways of thinking which systems processes and disciplines demand of the architect.

Organizing to do a project. With the possible exception of "two-stage bidding," described later in this article, the procedures by which K/M designs and supervises a construction program do not differ greatly from those of any successful firm. These procedures are:

1. Initial contact with the client and obtaining a contract.
2. Educational programming.
3. Building programming and project scheduling.
4. Preliminary design and schematic approval; obtaining other required approvals.
5. An optional competitive bidding of some subsystem components.
6. Preparation of working drawings and contact documents.
7. Letting of contracts by competitive bidding.
8. Supervision and inspection of construction.

It is the application of systems building within this organizational structure which makes the K/M experience unique and of interest to architects wishing to become involved with this new approach.

As the reader will see in the next section of this article, not only does K/M make use of the cost and scheduling advantages, and the new degree of flexibility possible with building systems, but the firm is able to use the inherent disciplines of systems building to its advantage. As mentioned earlier, K/M sources feel that the appplication of these conceptual and design disciplines within an already existing and effective office structure is, in large part, the source of their success. An active program of evaluation of both design and processes is another important part of the systematic procedure used by K/M.



NORWELL HIGH SCHOOL
Basic Structure

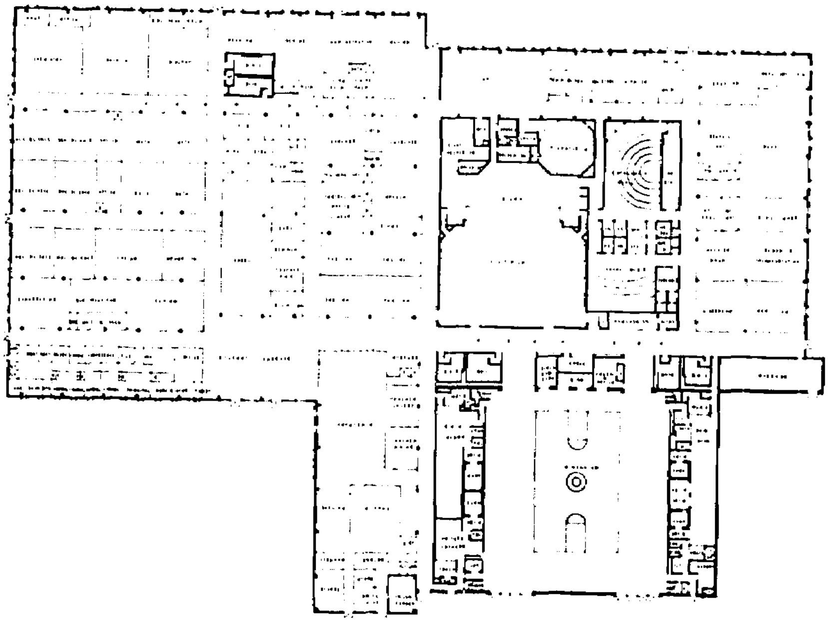
Flexibility With Systems

"K/M AND SYSTEMS BUILDING AS VIEWED BY K/M ASSOCIATES . . . the systems approach to building schools is based on the use of prefabricated components or subsystems. The result is a built-in 'flexibility' that can respond to changing educational needs in the future."

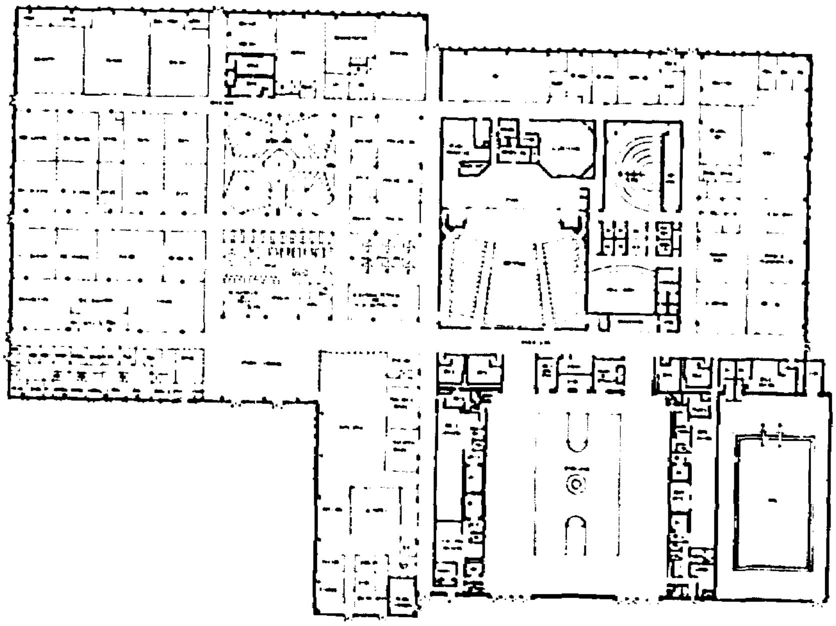
This statement is illustrated by drawings developed by K/M for Norwell High School. These drawings show how the school plan might change in response to changing needs of educational programming or enrollment.

At Norwell, demountable and operable partitions are used in a large loft-type space to produce a plant which can accommodate either open-space or more traditional teacher-classroom educational programs.

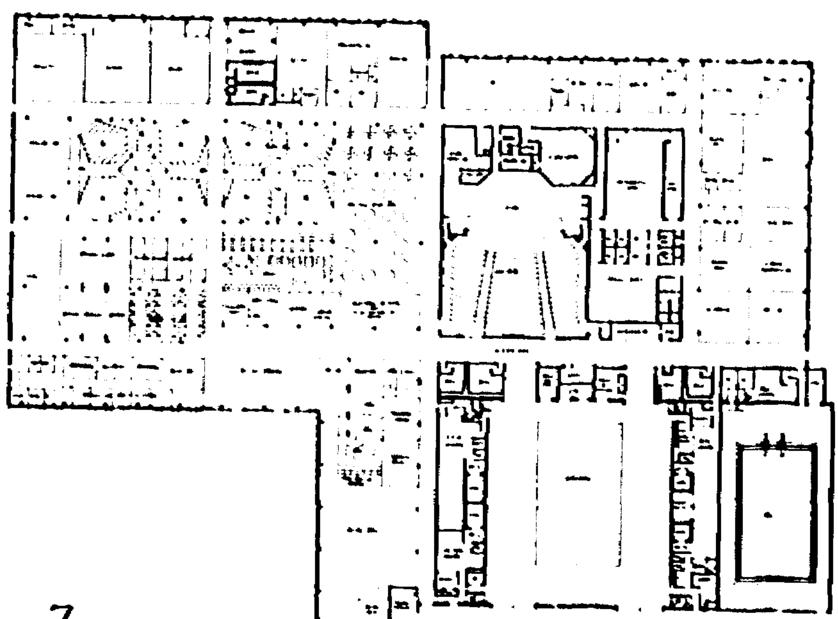
First Phase Interior



Second Phase Interior



Third Phase Interior



What Lessons Can Be Learned from K/M's Experience With Building Systems?

In an involvement with systems building procedures which has produced over a dozen systems-built schools in three years, K/M Associates has learned a number of things about the use of this technique. This section will discuss some of the points which can be of use to other professionals interested in studying and adopting the systems building approach.

Using building systems, a firm can provide better buildings in less time at the same or lower costs than by conventional construction techniques. Although K/M's early systems projects had "the same cost" as traditionally built projects Miller feels that recent experience indicates that systems buildings are now less costly. This cost advantage Miller attributes to the lower on-site labor requirements of building systems. Because building systems use less on-site and more factory labor than the traditional methods and because on-site labor costs are rising faster than factory labor costs, the systems user has smaller labor cost increases.

Miller also feels that the use of systems techniques by K/M has reduced total project time to about two-thirds that required on conventionally constructed projects. This time saving can be attributed to various factors, including reduction in on-site construction time, schedules which allow earlier ordering of materials and better architectural office scheduling allowing a reduction in design and drafting time.

An office which uses building systems effectively can use this fact to advantage when approaching potential clients. K/M has found that the ability to produce what the firm refers to as "better schools in less time at the same or lower costs" can be an important factor in the obtaining of new work. It must be remembered, however, that building systems work with and do not substitute for skillful, sensitive, and aesthetic design. K/M's completed systems schools, illustrated in this article, are an important element in their success in obtaining new work.

In addition to quality, time, and cost advantages, K/M attempts to point out to potential clients that another major advantage of the use of building systems is the flexibility of current components. A school constructed with a building system has a great capacity for adaptation to changing spatial and user needs. Although vitally concerned with housing current educational programs, K/M recognizes and points out to clients the importance of identifying new directions in educational practice and philosophy and the related importance of designing school plants to enable and not stifle possible future programs.

Two-stage bidding is a technique which may be used effectively by an architectural office on single projects. In most construction projects, bids are taken following the completion of the working drawings and related contract documents. Two-stage bidding, as used on the SCSD Project and by K/M Associates, retains bidding after document completion but adds an earlier bidding of key components, known as "prebidding." Prebidding normally takes place following the approval of preliminary or schematic plans by the client.

Prebidding, then, is the taking of competitive bids, based on preliminary design and abridged specifications, which are often performance oriented, for building system and other components before the development of working drawings. When components are prebid in this manner, the architect can develop a final design and all working drawings and documents using the selected components.

In addition, the architect is in a better position to control project costs as he is working with known costs for the components which have been prebid. Costs may be obtained either as unit prices as or a lump sum for all of the subsystem components required for the project, this latter form being easily converted to a cost per square foot. With the exception of possible escalation clauses and variances to allow for late design modifications, costs obtained by prebidding are not estimates but are real costs binding upon the contractor.

Whenever possible, K/M prebids the structural and lighting-ceiling subsystems. Other subsystems are not prebid because K/M feels that there is now sufficient competition in most areas between manufacturers of these components to insure good bids. In addition, little or no schedule improvement occurs when other components are prebid.

Prebidding of the structural system requires the preparation of a framing plan using the standard structural bay plans described earlier. The architects select the structural bay plans—"standard multi-module groups" —which best fit the approved preliminary space plan. The Structural Department develops these selections into the prebid framing plan. As mentioned earlier, the prebid structural package contains sufficient details to enable local steel fabricators to bid against the manufacturers of proprietary structural systems.

A further advantage in project scheduling accrues from the structural prebidding. After prebid nomination, the successful structural bidder reserves all main steel stock required on the job, thereby saving from two to three months on the procurement of raw materials. In some cases, the bid package from K/M is designed so that the fabricator can use the drawings as shop drawings, allowing time savings and cost reductions.

Use of performance specifications is a valuable method of bidding some components. However, once the performance of products is familiar to the architect, this knowledge can be used in place of the full performance specifications and testing process. The full procedure is necessary only for new and unfamiliar products which do not have independently established test data available.

Performance specifications for building components, that is, specifying what a product must do rather than what it must be, have been used widely in the purchase of building systems. There are three primary reasons for the use of performance-oriented specifications:

1. To encourage manufacturers to develop new products.
2. To allow manufacturers to make the most economical product combinations on a given project.
3. To obtain specific performance levels.

The full performance specifications procedure, with its costly and time-consuming testing and verification program, is most useful in systems development projects, such as SCSD, SEF, and RAS, where new products are being actively sought. It is, indeed, the function of these development projects not only to stimulate development but also to test new products for performance.

In its experience with building systems, K/M Associates has found that the use of performance specifications on single projects is valuable, but that the full formal testing procedure need not be applied every time. The first time a product is used, and this is normally done in one of the development programs, it may be necessary to obtain or generate extensive information about the ability of the product to perform as required. Once the performance of a product line is established, however, K/M feels that manufacturer's data, carefully considered, forms an adequate basis for using the product in the future.

Partially because of its commitment to the system building concept, K/M is in the unique position of being able to study the performance of numerous products in the schools they have designed. Study of the observed performance against that anticipated is another valuable input to product selection.

An architectural office can use both the dimensional and "performance" modules of building systems to advantage in design and design development. In the course of their work with building systems, K/M Associates has evolved a design process which makes use of the essentially modular nature of building systems products. Each building system component is designed to be dimensionally coordinated with components of other subsystems and to have optimal ranges of performance. K/M has identified these optimum applications and uses them as an effective design tool.

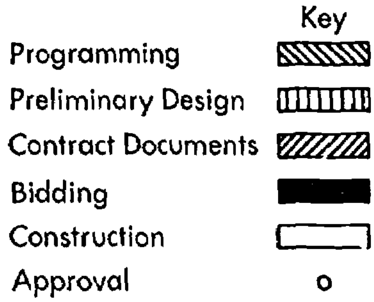
For structural planning, K/M's architects seek to use the maximum possible spans which are compatible with the design conditions of each project. Most of the proprietary structural subsystems are designed for most economic structural bay sizes ranging from 30′ by 30′ to 30′ by 60′ for floor spans, and from 30′ by 50′ to 30′ by 70′ for roof spans.[4] Thinking in terms of "supermodules" reduces the time required from programming to completed preliminary design and the complexities of converting preliminary schemes into developed designs.

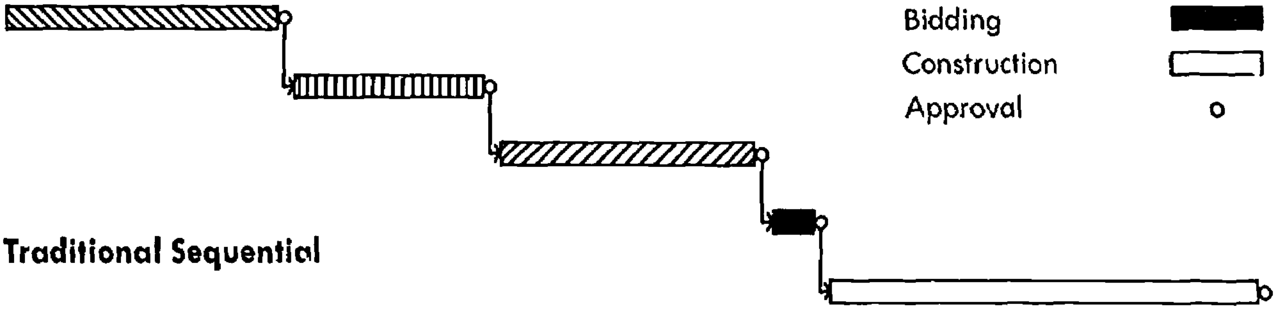
[4] Charts listing the most economic sizes for the proprietary structural subsystems may be found in BSIC Special Report Number 1: *Manufacturers' Compatibility Study.*

Flexible HVAC distribution systems, such as those used in most SCSD-type HVAC subsystems, allow this supermodule approach to be used for HVAC design as well. Once basic structural planning has been completed, K/M mechanical engineers develop a generalized HVAC plan for the typical structural bay. This typical bay is then repeated wherever possible within the design. The detailed distribution within each bay can then be worked out using the inherent flexibility of the distribution system.

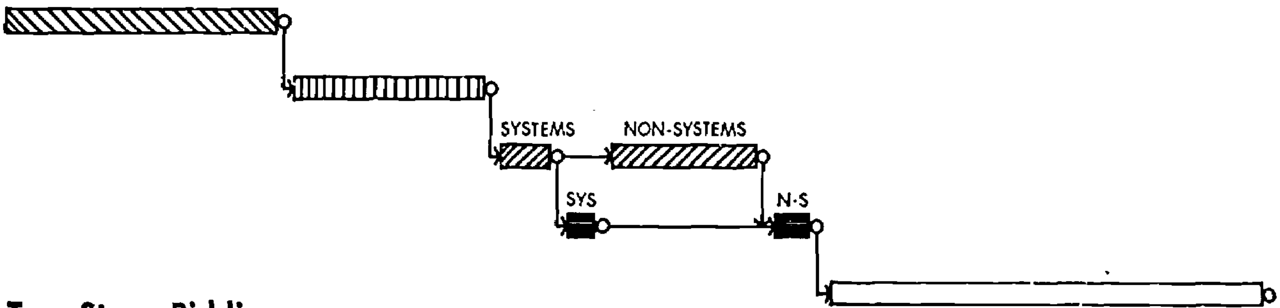
K/M is using these supermodular techniques as part of an effort to work toward a fast-track or overlapping scheduling method. In fast-track scheduling, activities are overlapped, a subsequent action beginning during an earlier activity rather than awaiting its conclusion. Typical fast-track scheduling is illustrated in the chart on the following page. Miller is hopeful that, through this type of scheduling, improved building performance can be achieved by deferring final space programming until the latest possible moment.

Scheduling With Systems



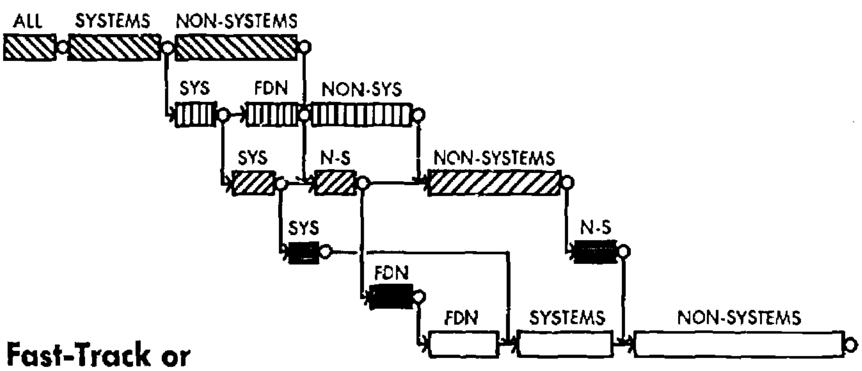


Traditional Sequential



Two-Stage Bidding

In two-stage bidding, certain subsystems are bid following approval of preliminary design and necessary document development. Because the architect is working with known products in working drawings, better detailing and cost control are possible.



Fast-Track or Overlapping

By overlapping activities in Fast-Track scheduling, dramatic project delivery time savings may be achieved. Coordination between phases, cost control, and assurance of the ability to get decisions when needed are essential.

Building Systems and the Architectural Office

K/M Associates' experience demonstrates that intelligent use of building systems offers to the architectural office opportunities to increase its design effectiveness while reducing office costs and shortening design and construction schedules. For K/M, this is largely the result of two factors. The first of these is their recognition of the fact that it is use of the systems approach, processes and procedures as well as the "hardware," which makes effective application of building systems possible. The second is their success in integrating the required new methods for systems use with their office procedures.

This article has attempted to describe some system building processes and procedures and to show how they might be used. Some of these methods are:

1. Two-stage bidding.
2. Use of performance specifications without making these specifications an end in themselves.
3. Exploitation of the modular nature of building systems.
4. Fast-track scheduling combined with building systems.
5. Use of the inherent flexibility of building systems components.

In the case of K/M Associates, these techniques have been combined with effective office structure and procedures as a comprehensive policy. The intuitive faculties of staff architects and engineers are relied upon, but these faculties are exposed to systems building disciplines and processes.

The processes and procedures of systems use offer a chance for architectural and related design offices to make a more effective use of their resources. As has been shown in the case of K/M, two-stage bidding, a simplified form of fast-tracking, allows the architect to work with the most knowns when developing the design and details of construction. This work load reduction may be applied to reducing office costs or to freeing designers, currently burdened with detailing, for more important aspects of project development. In addition, multi-stage bidding enables the architect to exercise better cost control and project decision making.

By applying these kinds of scheduling techniques within the office, the firm can more effectively develop designs and possibly make considerable reductions in the in-office project time. The use of supermodules, of framing plans that are used as office "standards," and of early bidding of structure and lighting-ceiling are some of the ways in which K/M Associates has applied these processes. For K/M, use of these techniques has proven profitable.

There is another side to the balance, however, and that is the investment of time and money which the office must make in order to develop an understanding of building systems and to integrate systems processes with office operations. Like any innovative technique, systems building demands that its users make the effort to learn to use it. The experience of K/M Associates and of numerous other firms which have begun to use systems is that this time is wisely invested and that it produces a high return.

A Portfolio of K/M's Systems Schools

Adams Central School Addition

Adams Central Community Schools, Monroe, Indiana

Building size: 78,000 square feet, to increase school capacity to 1,600 pupils

Subsystems:

- STRUCTURE: Macomber V-LOK
- LIGHTING-CEILING: Armstrong C-60
- HVAC: Mammoth
- INTERIOR PARTITIONS: Doan CRUSADER

Building cost: $1,966,806.00 or $25.21/square foot

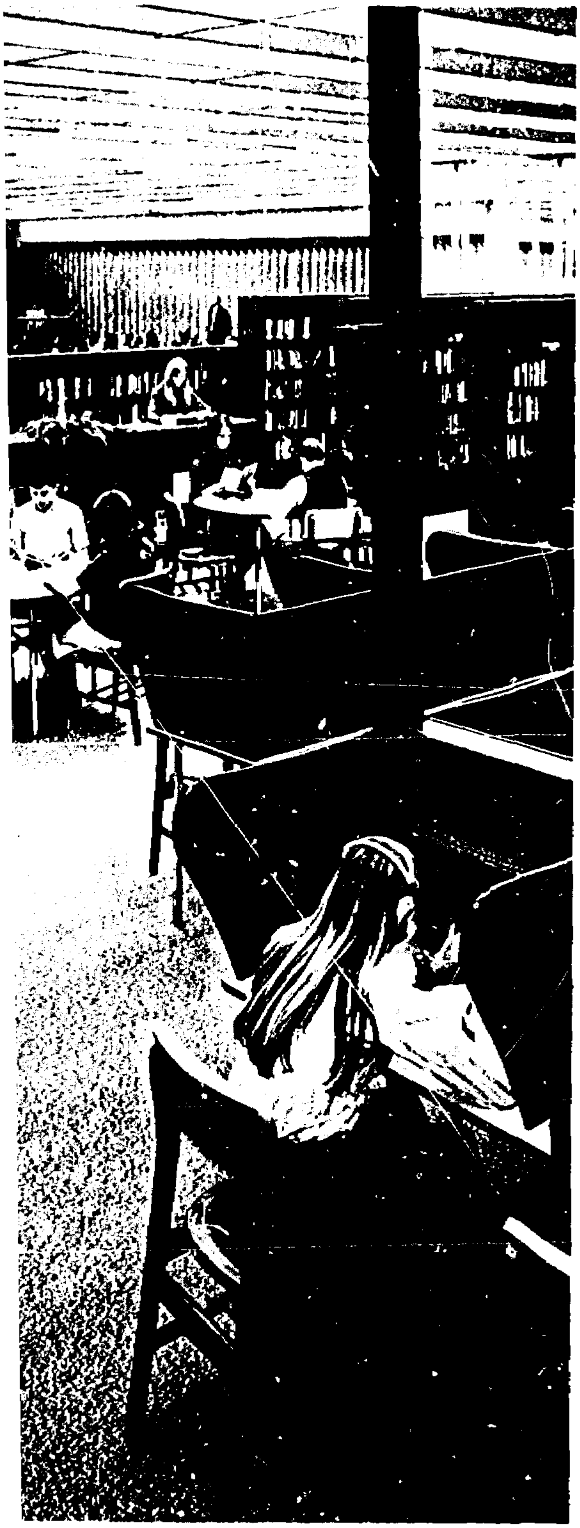
Cost of system components only: $5.63/square foot

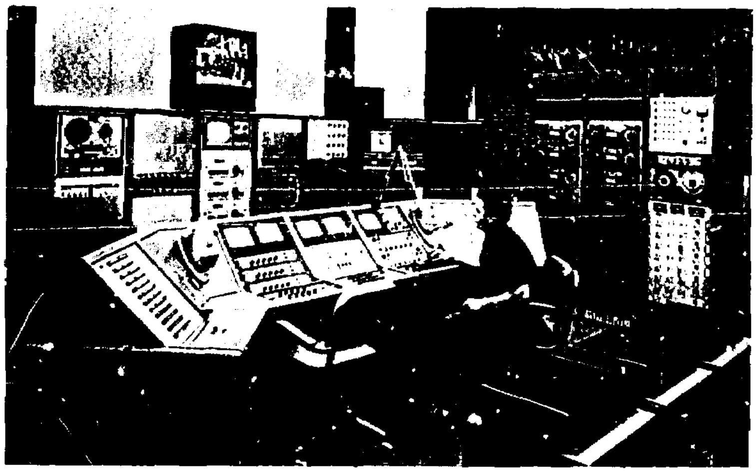
Completion date: September 1, 1968

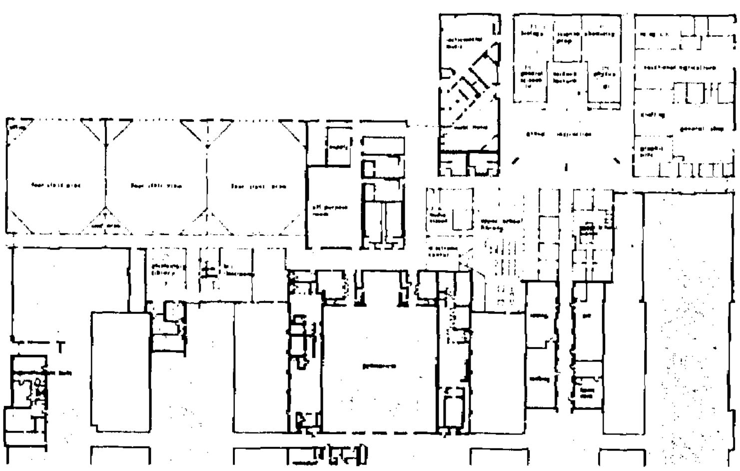
Located in a rural county with a large Amish minority, the K/M addition to the Adams Central School houses an unusually up-to-date educational program. The elementary and upper school, equivalent to high school, programs are in the new portion of the school, while the middle school and school district offices are located in the old building.

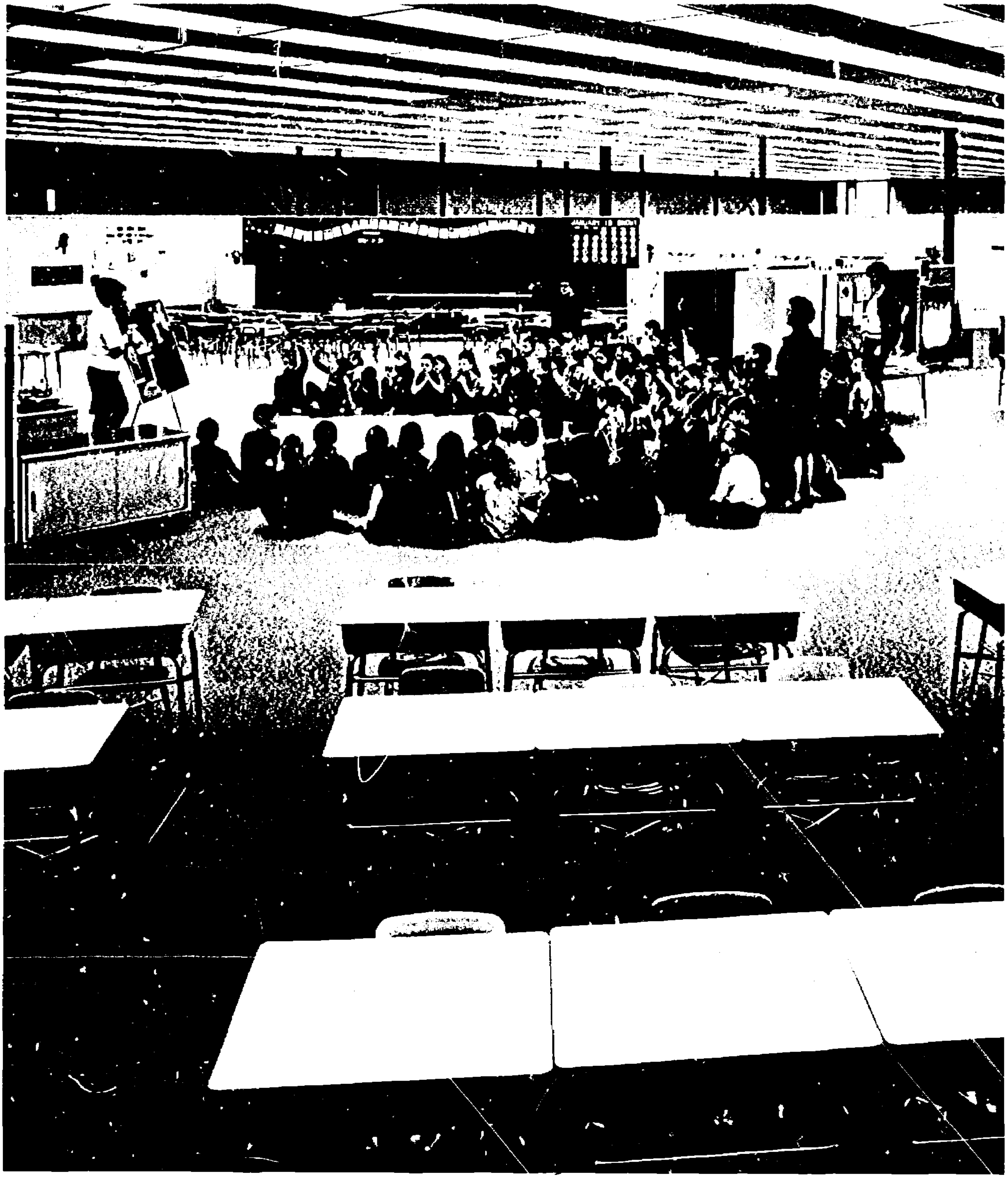
Team teaching is practiced in the elementary grades in three large open spaces, each containing the space equivalent of four classrooms. In terms of the structural, HVAC, and lighting-ceiling subsystems, the elementary classroom wing is one space, part of which is divided by demountable partitions into the three large teaching areas.

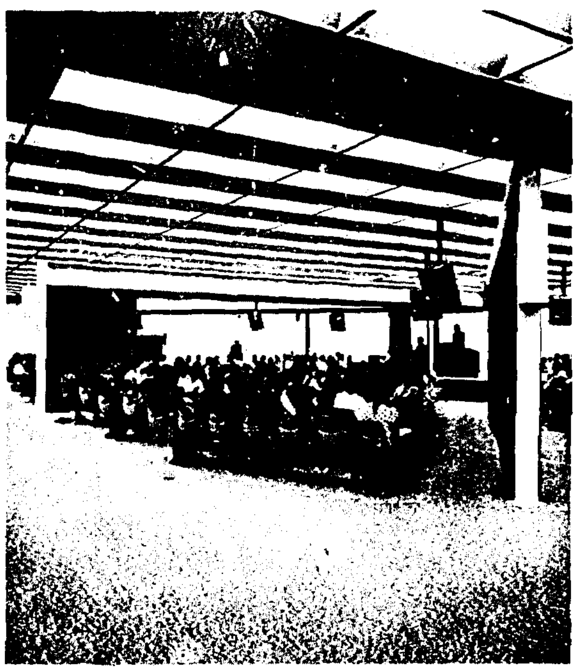
The upper school curriculum is rich in the use of instructional media, such as "wet" carrels and closed-circuit television. Teaching spaces in the upper school are in a variety of sizes surrounding a large group instruction area. This large group area may be divided into as many as five smaller spaces by operable partitions.

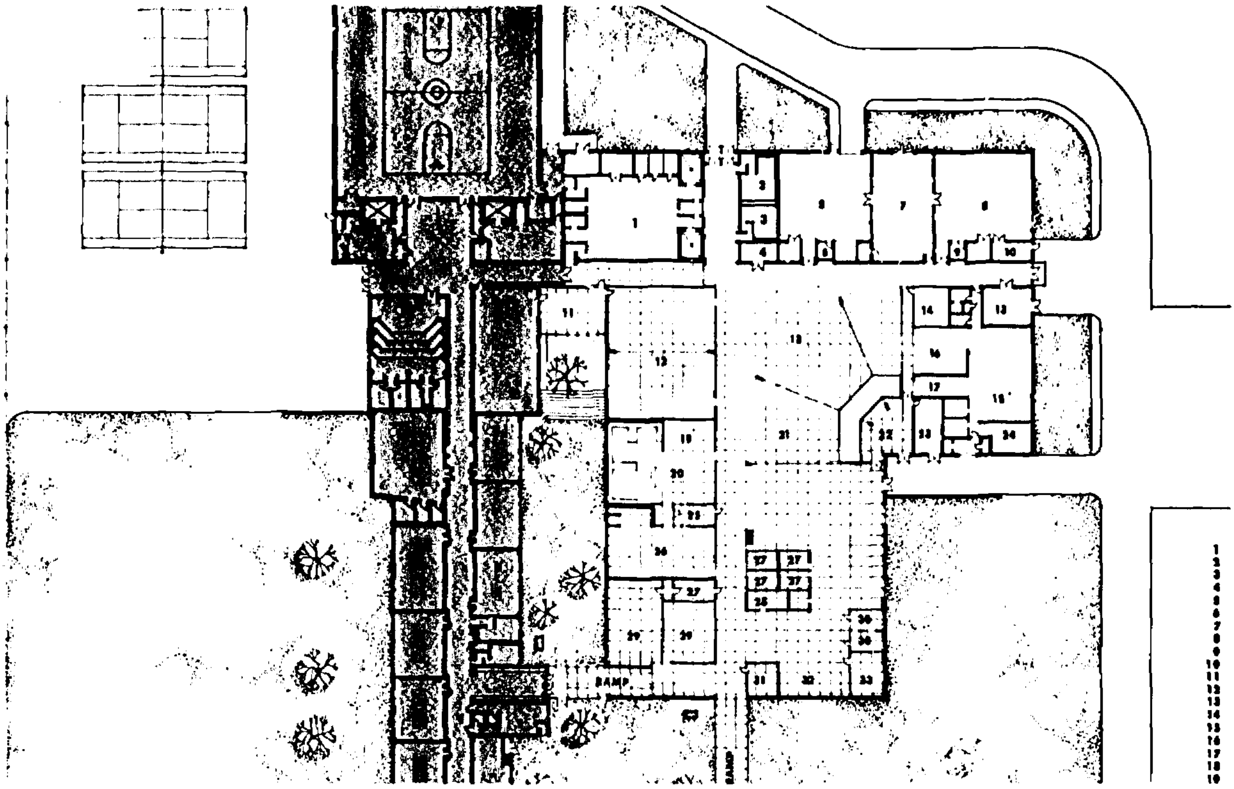






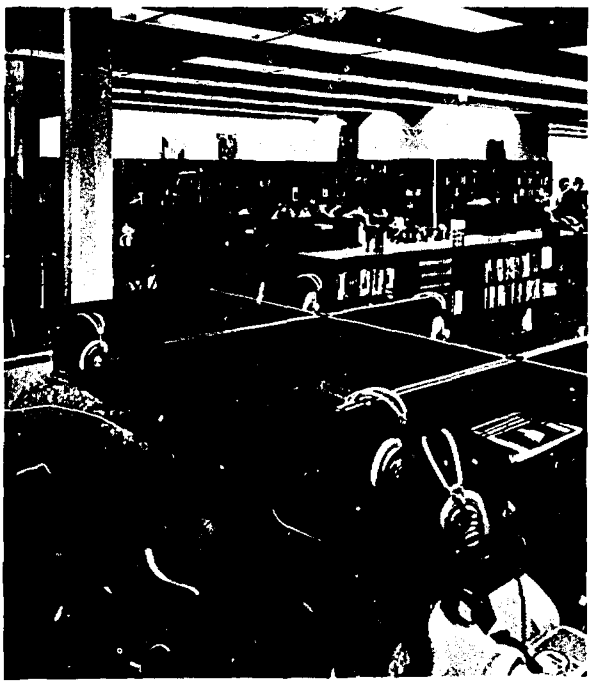


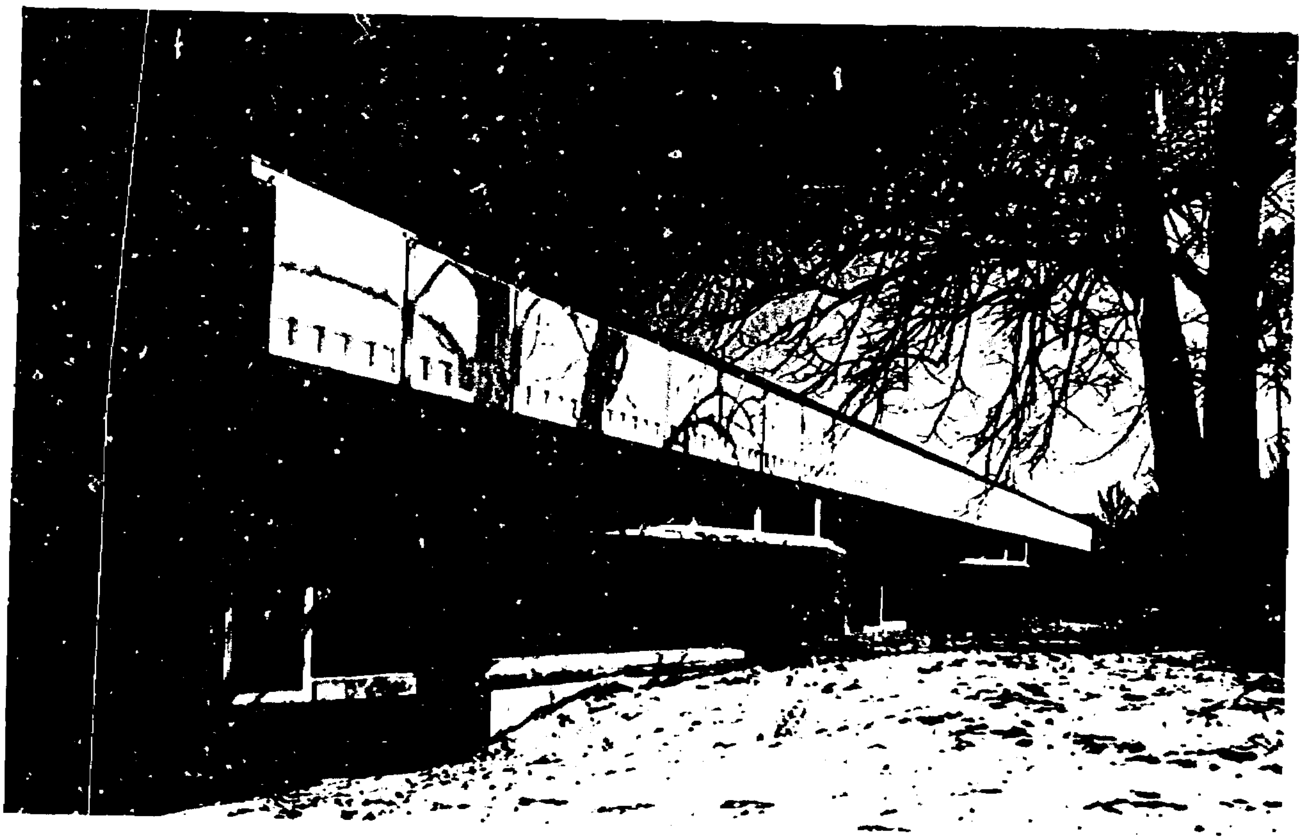


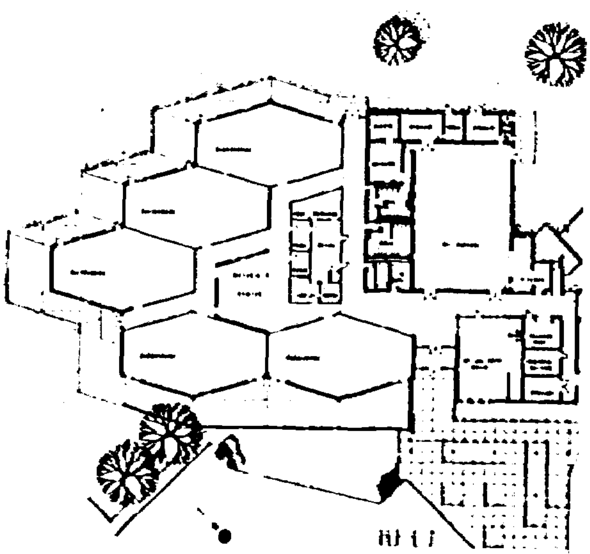


Brookdale Junior High School Addition

ELKHART COMMUNITY SCHOOLS, ELKHART, INDIANA
Building size: 48,396 square feet, to increase school capacity to 900 pupils
Subsystems:
STRUCTURE: Macomber V-LOK
LIGHTING-CEILING: Armstrong C-60
HVAC: Dial-A-Temp
INTERIOR PARTITIONS: Hauserman DOUBLE-WALL
Building cost: $969,533.00 or $20.03/square foot
Cost of system components only: $5.77/square foot
Completion date: September 1, 1968

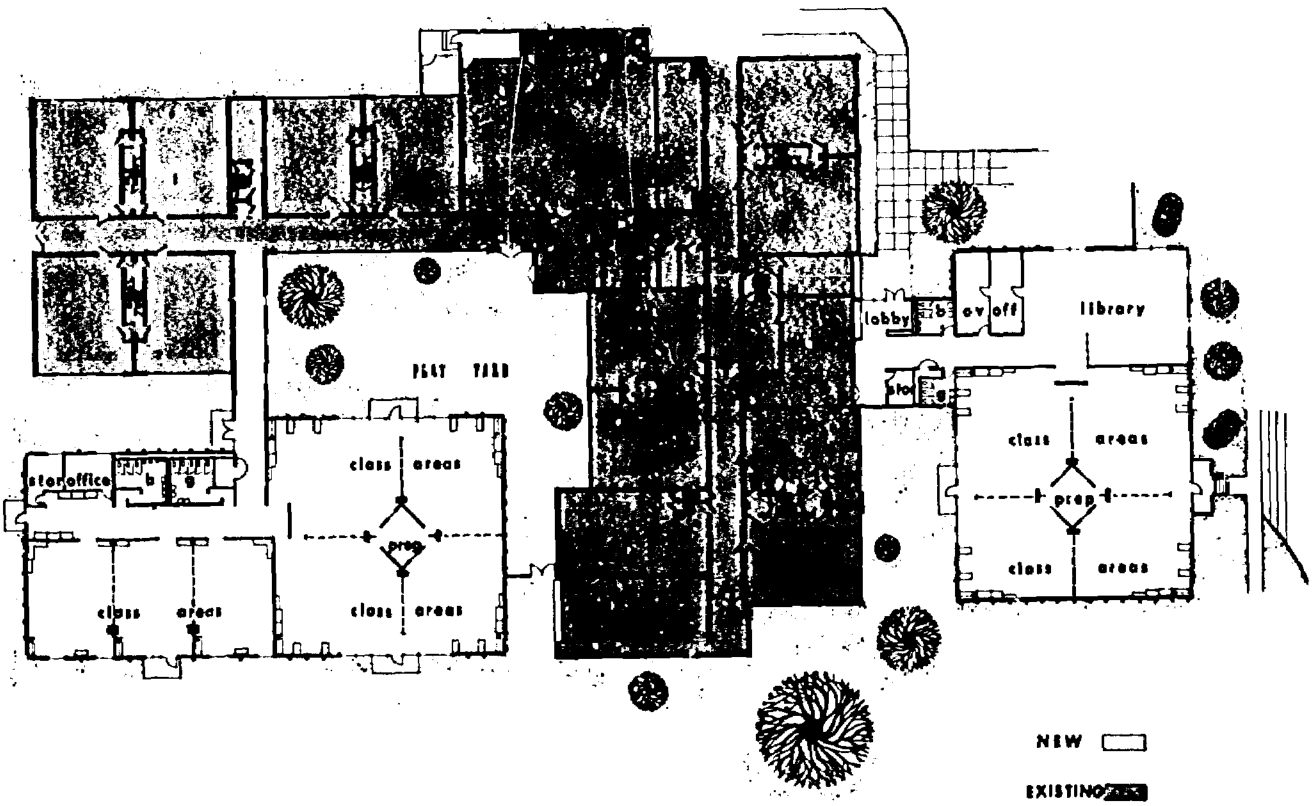






Mary Beck School Addition

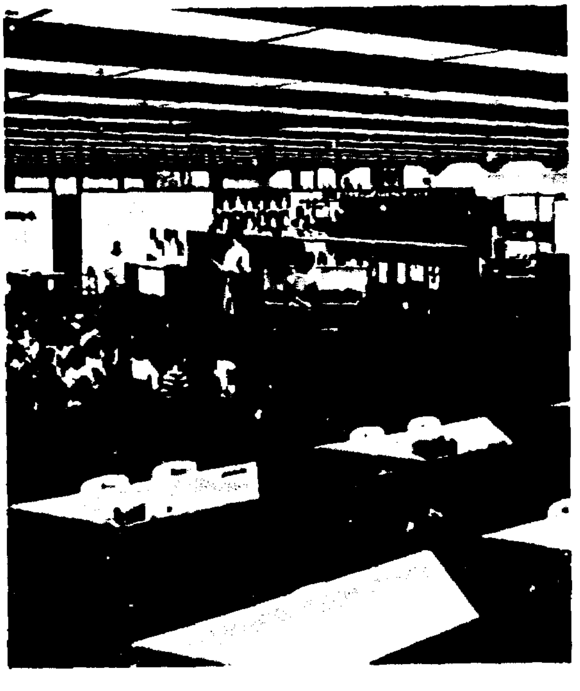
ELKHART COMMUNITY SCHOOLS, ELKHART, INDIANA
Building size: 34,079 square feet, to accommodate 450 pupils
Subsystems:
STRUCTURE: Macomber V-LOK
LIGHTING-CEILING: Armstrong C-60
HVAC: ITT Nesbitt RTMZ
INTERIOR PARTITIONS: Hauserman DOUBLE-WALL
Building cost: $558,640.00 or $16.39/square foot
Cost of system components only: $5.07/square foot
Completion date: September 1, 1968



Madison Elementary School Additions

WARSAW COMMUNITY SCHOOLS, WARSAW, INDIANA
Building size: 19,888 square feet, to accommodate 330 pupils
Subsystems:
- STRUCTURE: In-House Design
- LIGHTING-CEILING: Armstrong C-60
- HVAC: Mammoth
- INTERIOR PARTITIONS: Donn CRUSADER

Building cost: $395,137.00 or $19.87/square foot
Cost of system components only: $5.48/square foot
Completion date: September 1, 1968



Washington Elementary School

Plymouth Community Schools Corporation,
Plymouth, Indiana

Building size: 44,207 square feet, to accommodate 540 pupils

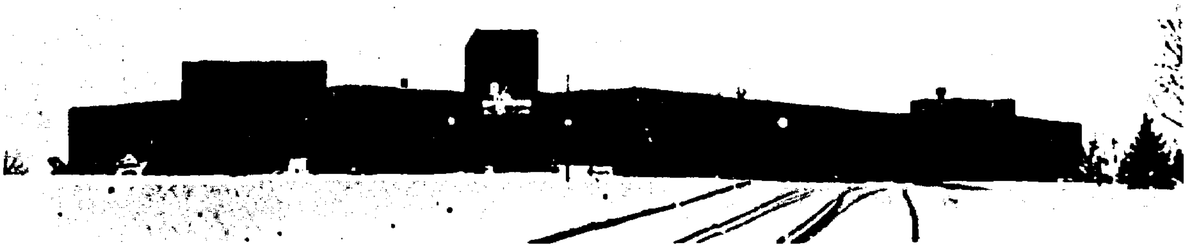
Subsystems:

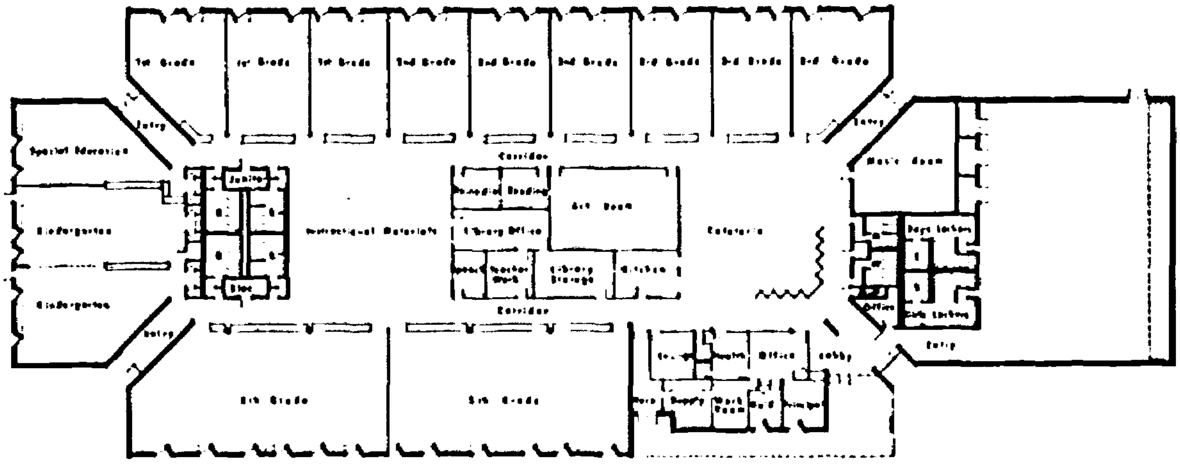
- STRUCTURE: In-House Design
- LIGHTING-CEILING: Conwed
- HVAC: Trane Multizone
- INTERIOR PARTITIONS: Penn Metal

Building cost: $883,155.00 or $19.97/square foot (*includes all furnishings*)

Cost of system components only: $4.23/square foot

Completion date: January, 1970





Columbia City Joint High School Addition

COLUMBIA CITY, INDIANA
Building size: 44,094 square feet
Subsystems:
STRUCTURE: Macomber V-LOK
LIGHTING-CEILING: Armstrong C-60
HVAC: Miller-Picking
INTERIOR PARTITIONS: Hauserman DOUBLE-WALL
Building cost: $885,771.00 or $18.32/square foot
Cost of system components only: $6.27/square foot
Completion date: September 1, 1968

Princeton Community High School

NORTH GIBSON SCHOOL CORPORATION, PRINCETON, INDIANA
Building size: 225,900 square fe t
Subsystems:
STRUCTURE: Macomber V-LOK
LIGHTING-CEILING: Armstrong C-60
HVAC: ITT Nesbitt RTMZ
INTERIOR PARTITIONS: Hauserman DOUBLE-WALL
Building cost: $4,996,362.00 or $21.30/square foot
Cost of system components only: $5.01/square foot
Completion date: September 1, 1970

Library and Science Building

INDIANA UNIVERSITY, SOUTH BEND, INDIANA
Building size: 160,956 square feet in five stories plus basement
Subsystems:
STRUCTURE: In-House Design, Precast Concrete
LIGHTING-CEILING: Armstrong C-60
HVAC: In-House Design
INTERIOR PARTITIONS: Flangeclamp
Building cost: $4,977,685.00 or $30.93/square foot
Cost of system components only: $12.92/square foot
Completion date: Under construction
Note: Structural subsystem includes exterior wall exclusive of glazing, fittings, etc.

Riverside Hall (Dental Hygiene Building)

INDIANA UNIVERSITY, SOUTH BEND, INDIANA
Building size: 11,400 square feet
Subsystems:
STRUCTURE: In-House Design
LIGHTING-CEILING: Armstiong C-60
HVAC: Mammoth
INTERIOR PARTITIONS: Penn Metal
Building cost: $307,311.00 or $26.96/square foot
Cost of system components only: $6.50/square foot
Completion date: October 31, 1969
Note: Construction was undertaken on Riverside Hall on June 1, 1969

Norwell High School

NORTHERN-WELLS COMMUNITY SCHOOLS, OSSIAN, INDIANA
Building size: 145,353 square feet, to accommodate 900 pupils
Subsystems:
STRUCTURE: Butler SPACE GRID
LIGHTING-CEILING: Hauserman
HVAC: Lennox DMS-1
INTERIOR PARTITIONS: Hauserman DOUBLE-WALL
Building cost: $2,974,939.00 or $20.45/square foot (includes all site work)
Cost of system components only: $4.32/square foot
Completion date: September 1, 1968

Upland Junior High School Addition

UPLAND, INDIANA
Building size: 12,958 square feet, to accommodate 210 pupils
Subsystems:
STRUCTURE: In-House Design
LIGHTING-CEILING: Luminous Ceilings TEC VIII
HVAC: Flexible distribution tied to existing system
INTERIOR PARTITIONS: Hauserman READY WALL
Building cost: $247,427.00 or $19.10/square foot
Cost of system components only: $5.82/square foot
Completion date: September 1, 1970

The Systems Clearinghouse was established by a grant from the Educational Facilities Laboratories, Inc. This report, as well as subsequent publications dealing with buildings systems, is available from the Systems Division, School Planning Laboratory, School of Education, Stanford, California 94305.

FRONT COVER: Systems Building 1851
London, The Crystal Palace

BACK COVER: Systems Building [illegible]
[illegible], California, John F. Kennedy High School

[illegible] photos by Donald [illegible] pp. 4 (bottom), 18-43
[illegible] pp. [illegible], 15, 19-21, 23
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